Claims

We claim:

1. A wireless communication system comprising:

a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, each transceiver antenna transmitting a corresponding data stream;

a plurality of receiver antennae, the receiver antennae receiving at least one data stream; wherein

the transceiver antenna polarization of each transceiver antenna is pre-set to optimize separability of the received data streams.

2. The wireless communication system of claim 1, wherein the pre-set transceiver antenna polarization of each transceiver antenna is determined experimentally.

3. The wireless communication system of claim 2, wherein the pre-set transceiver antenna polarization of each transceiver antenna is experimentally determined by characterizing the separability of received data streams.

4. The wireless communication system of claim 2, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set transceiver antenna polarization of each transceiver

antenna is experimentally determined by minimizing a singular value spread of the channel matrix.

5. The wireless communication system of claim 1, wherein each receiver antenna is spatially separate from at least one other receiver antenna, each receiver antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna.

6. The wireless communication system of claim 1, further comprising a receiver that is connected to the receiver antenna, the receiver including electronic circuitry for estimating a channel matrix that represents a transmission channel between the transceiver antennae and the receiver antennae, the pre-set transceiver antenna polarization of each transceiver antenna being determined by minimizing a singular value spread of the channel matrix.

7. The wireless communication system of claim 5, wherein the receiver antenna polarization of each receiver antenna is pre-set to optimize separability of the received data streams.

8. The wireless communication system of claim 7, wherein the pre-set receiver antenna polarization of each receiver antenna is determined experimentally.

9. The wireless communication system of claim 8, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set receiver antenna polarization of each receiver antenna is experimentally determined by minimizing a singular value spread of the channel matrix.

10. The wireless communication system of claim 1, wherein the transceiver antenna polarization of each transceiver antenna is pre-set to minimize correlation between the data streams.

11. The wireless communication system of claim 10, wherein the pre-set transceiver antenna polarization of each transceiver antenna is determined experimentally.

12. The wireless communication system of claim 11, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set transceiver antenna polarization of each transceiver antenna is experimentally determined by minimizing a correlation coefficient of the channel matrix.

13. The wireless communication system of claim 5, wherein the receiver antenna polarization of each receiver antenna is pre-set to minimize correlation between the data streams.

14. The wireless communication system of claim 13, wherein the pre-set receiver antenna polarization of each receiver antenna is determined experimentally.

15. The wireless communication system of claim 14, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set receiver antenna polarization of each receiver antenna is experimentally determined by minimizing a correlation coefficient of the channel matrix.

16. The wireless communication system of claim 1, further comprising clusters of transceiver antennae, each cluster including a transmission channel, wherein the pre-set transceiver antenna polarization of each transceiver antenna is experimentally determined by minimizing co-channel interference between the clusters.

17. A wireless communication system comprising:

a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, each transceiver antenna transmitting a corresponding data stream;

a plurality of receiver antennae, the receiver antennae receiving at least one data stream; wherein

the transceiver antenna polarization of each transceiver antenna is adaptively set to optimize separability of the received data streams base on channel parameters determined within a receiver connected to the receiver antennae.

18. The wireless communication system of claim 17, wherein the receiver includes electronic circuitry for estimating a channel matrix that represent a transmission channel between the transceiver antennae and the receiver antennae, the transceiver antenna polarization of each transceiver antenna being adaptively set by minimizing a singular value spread of the channel matrix.

19. A method of wirelessly communicating between a transceiver and a receiver within a wireless communication system, the communication system comprising the transceiver, the transceiver comprising a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, the communication system further comprising the receiver, the receiver comprising a plurality of receiver antennae, the method comprising:

each transceiver antenna transmitting a corresponding data stream;

the receiver antennae receiving at least one data stream;

electronic circuitry within the receiver estimating a channel matrix that represents a transmission channel between the transceiver antennae and the receiver antennae; and

pre-setting the transceiver antenna polarization of each transceiver antenna by minimizing a singular value spread of the channel matrix.

20. The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 19, wherein each receiver antenna is spatially separate from at least one other receiver antenna, each receiver antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna, the method further comprising:

pre-setting the receiver antenna polarization of each receiver antenna by minimizing a singular value spread of the channel matrix.

21. The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 19, the method comprising:

pre-setting the transceiver antenna polarization of each transceiver antenna to minimize correlation between the data streams.

22. The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 20, the method comprising:

pre-setting the receiver antenna polarization of each receiver antenna to minimize correlation between the data streams.

23. A wireless communication system comprising:

a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, each transceiver antenna transmitting a corresponding data stream;

a plurality of receiver antennae, the receiver antennae receiving at least one data stream; and

means for setting the transceiver antenna polarization of each transceiver antenna to optimize separability of the received data streams.

24. The wireless communication system of claim 23, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the means for setting the transceiver antenna polarization of each transceiver antenna is responsive to minimizing a singular value spread of the channel matrix.

25. The wireless communication system of claim 23, wherein each receiver antenna is spatially separate from at least one other receiver antenna, each receiver antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna.

26. The wireless communication system of claim 23, further comprising a receiver that is connected to the receiver antennae, the receiver including electronic circuitry for estimating a channel matrix that represents a transmission channel between the transceiver antennae and the receiver antennae, wherein the means for setting the transceiver antenna polarization of each transceiver antenna is responsive to minimizing a singular value spread of the channel matrix.

27. The wireless communication system of claim 25, further comprising means for setting the receiver antenna polarization of each receiver antenna to optimize separability of the received data streams.

28. The wireless communication system of claim 27, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the means for setting the receiver antenna polarization of each receiver antenna comprises minimizing a singular value spread of the channel matrix.

29. The wireless communication system of claim 25, further comprising means for setting the receiver antenna polarization of each receiver antenna to optimize de-correlation of the received data streams.

30. The wireless communication system of claim 29, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel

matrix, and wherein the means for setting the receiver antenna polarization of each receiver antenna comprises minimizing a correlation coefficient of the channel matrix.

31. The wireless communication system of claim 1, wherein the pre-set transceiver antenna polarization of each transceiver antenna is determined experimentally.